Evaluating the Alignment of Items Added to the Harcourt Assessment in Mathematics with the South Dakota's Academic Content Standards in Mathematics at Grades 3 and 11

Final Report

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On May 23, 2005 the Buros Institute for Assessment Consultation and Outreach (BIACO), under contract with South Dakota's Department of Education (SDE), conducted a study to examine the alignment of the Dakota STEP tests in Mathematics with South Dakota's Core Standards in Mathematics at Grades 3, 4, 5, 6, 7, 8, and 11. An analysis of those results indicated some cases where there were an insufficient number of items measuring South Dakota's Core Standards in Mathematics at Grades 3 and 11.

The purpose of this project was to determine the degree to which items added to the Harcourt Assessment in Mathematics are aligned (in terms of both content and proficiency level) with South Dakota's Mathematics Standards at Grades 3 and 11.

Procedures

Staff from SDE identified teachers for the Alignment Study. A total of 21 South Dakota educators, 5 for grade 3 and 16 for grade 11, participated in the Alignment Study held in Sioux Falls, SD. On average (mean), the third grade teachers had over 17 years experience; the 11th grade teachers averaged (mean) more than 14 years experience. One of the 3rd grade and nine of the 11th grade teachers held advanced degrees. A list of the school districts from which the participating teachers were employed is included as Appendix A.

Training for teachers began with an overview of the tasks to be addressed in the workshop. It was explained that the purpose of the workshop was to determine the match of the questions in the Dakota STEP mathematics test to South Dakota's content

standards in mathematics. This orientation session was conducted with the full group of teachers.

Next, teachers were divided into grade level groups. Together, with a facilitator, teachers discussed the standards and performance level descriptors for each grade level test they were considering. Once the group had discussed these standards and performance level descriptors, teachers participated in a training activity using a subset of items from the Mathematics item booklets. Three items from the Mathematics test were chosen from grade 3 and three were chosen from grade11.

Using forms designed specifically for this project (See example in Appendix B), teachers evaluated the match of these training items to the relevant content standards and performance levels. Teachers were instructed to evaluate the match of an item to the standard by performance level using either a “B” for a match of the standard at the Basic level, a “P” to indicate a match at the Proficient level, and an “A” for a match at the Advanced level. Teachers were encouraged to only mark one standard for each test question: the one that represented the primary alignment for the test question. If no match was found, the teachers indicated “No Match.”

After teachers made their alignment decisions for the practice items, the small group reviewed results with discussion elicited by the facilitator to clarify the meaning of the standards, the meaning of the performance level descriptors, and the procedures used in making these alignment decisions. Each small group identified a group leader whose responsibilities were to lead the group discussion and fill out the group’s consensus forms. Group leaders were instructed to elicit discussion regarding the group’s decision as to the relevant content standard and performance level match for each item. Group

leaders were also asked to keep the group on task within the timeframe allowed for the consensus activity. After the discussion, each group leader filled out the Consensus Rating Form for the group. This ended the group consensus process.

After group consensus, the panels proceeded to the full set of new items. The procedure followed for the full set of items was the same as the practice, with the exception that after the group consensus process was completed the panels received information on the item alignment as recommended by Harcourt Educational Measurement (HEM). Each panel was instructed to reconcile any disagreement between their group consensus alignment results and HEM's alignment recommendations. They could either select the HEM recommendation, their original group consensus, another Indicator and Alternate Content Standard, or indicate there was no match to any Indicators and Alternate Content Standards by marking an "X". If a match was made, they indicated the appropriate performance level.

At the conclusion of the workshop, panelists completed an evaluation of the training session and the alignment rating process and were given certificates of participation.

Results

All of the Goal areas, across the grade level tests, had at least 7 items matched to these goals after combining items already found to align with HEM's intended alignment and new items added since the May, 2005 alignment study. The largest number of matches was reported for the Algebra goal; the smallest number of matches was shown for the Measurement goal. The target for test development was to have 7 items per indicator. The results are presented in Table 1 and summarized below by Goal area.

- **Algebra**: The target of 7 items per Indicator was met for all four Indicators at Grade 3; item counts for Indicators 1 and 4 met this target for Grade 11.
- **Geometry**: The target of 7 items per indicator was met for Indicator 2 at Grade 3; item counts for Indicator 1 met this target for Grade 11.
- **Measurement**: Indicator 1 met the 7-item target for both grade levels.
- **Number Sense:** Indicators The target of 7 items per indicator was met for all three Indicators at Grade 3 and 11.
- **Statistics and Probability**: Item counts for Indicator 2 met this target for Grade 3; the target of 7 items per indicator was met for both Indicators at Grade 11.

Table 2 summarizes the overall alignment results before and after reconciliation. Results indicate that after reconciliation 96% of the 3rd and 11th grade items align with HEM's intended alignment.

Table 3 summarizes the alignment results for each goal by achievement level for grades 3 and 11 combining items already found to align with HEM's intended alignment. These results are also summarized below by grade level. Note that while the teachers for grade 11 found no misaligned items, three Grade 11 items (items 39, 56, and 91) matched goals/indicators/standards different from those indicated by HEM, while one Grade 3 item (item 76) matched goals/indicators/standards different from those indicated by HEM. In addition, two grade three items, items 84 and 90, on the 2006 test were treated as not matching any intended HEM goal/indicator/standard because no record of their alignment to the standards can be identified in the 2005 alignment study. More specific details about item level matches for grades 3 and 11 are included in Appendixes C and D, respectively.

- **Grade 3:** Eight items have been assigned to the Basic category, 49 to the Proficient category, and 24 to the Advanced category. Eighty-one of the 84 existing items align to and match the goal/indicator/standard intended by HEM alignment results.
- **Grade 11:** Five items have been assigned to the Basic category, 49 to the Proficient category, and 27 to the Advanced category. Eighty-one of the 84 existing items align to and match the goal/indicator/standard intended by HEM alignment results.

Table 1
Mathematics Alignment Summary*

Goal / Indicator	Grade 3 May 2005	Grade 3 May 2006	Grade 3 Total	Grade 11 May 2005	Grade 11 May 2006	Grade 11 Total
Algebra	**22**	**5**	**28**	**21**	**5**	**26**
1	5	2	7	4	3	7
2	4	3	7	6	0	6
3	7	0	7	4	2	6
4	7	0	7	7	0	7
Geometry	**12**	**0**	**12**	**9**	**4**	**13**
1	5	0	5	5	2	7
2	7	0	7	4	2	6
Measurement	**7**	**0**	**7**	**7**	**0**	**7**
1	7	0	7	7	0	7
Number Sense	**21**	**0**	**21**	**19**	**2**	**21**
1	7	0	7	7	0	7
2	7	0	7	7	0	7
3	7	0	7	5	2	7
Statistics and Probability	**6**	**7**	**13**	**4**	**10**	**14**
1	5	1	6	4	3	7
2	1	6	7	0	7	7
Total No. of matches in agreement with HEM	69	12	81	60	21	81

* Note, 13 items were reviewed for alignment at grade 3, while 24 items were reviewed for alignment at grade 11 during the May, 2006 alignment study. Also, two items are part of the 2006 operational test at grade 3, but no record of their alignment to the standards can be identified in the 2005 alignment study. These are items 84 and 90 on the 2006 grade 3 test.

Table 2
Alignment of Items to Harcourt Intended Alignment Before and After Reconciliation

	Number of Test Items	Pre-Reconciliation				Post-Reconciliation							
								Disagree with Harcourt					
		Agree with Harcourt		Disagree with Harcourt		Agree with Harcourt		Kept Original Group Consensus		Aligned to Other Indicator & ACS		Not Aligned to any SD Indicator & ACS	
Grade 3**	84	81	96%	3*	4%	81	96%	1	1%	0	0%	2*	2%
Grade 11	84	76	90%	8	10%	81	96%	3	4%	0	0%	0	0%

* Two items are part of the operational test at grade 3, but no record of their alignment to the standards can be identified in the 2005 alignment study. These are items 84 and 90 on the 2006 grade 3 test.
** Percentages may not add to 100% because of rounding.
Note: Thirteen items were considered for alignment at 3rd grade and 24 items were considered for alignment at 11th grade.

Table 3
May 2005 and 2006 Post-Reconciliation Mathematics Alignment Results:
Goals by Achievement Level for Grades 3 and 11

	Achievement Level			
Grade Goal	Basic	Proficient	Advanced	Total
Grade 3	**8**	**49**	**24**	**81**
Algebra	2	17	9	**28**
Geometry	1	8	3	**12**
Measurement	1	3	3	**7**
Number Sense	0	14	7	**21**
Statistics and Probability	4	7	2	**13**
Grade 11	**5**	**49**	**27**	**81**
Algebra	0	21	5	**26**
Geometry	0	9	4	**13**
Measurement	0	2	5	**7**
Number Sense	0	15	6	**21**
Statistics and Probability	5	2	7	**14**

Workshop Evaluation

At the conclusion of the Alignment Study Workshop, teachers completed an evaluation form consisting of three parts. Part 1 focused on the orientation and training; Part 2 focused on the levels of confidence and length of time allocated to make judgments; and Part 3 focused on an overall evaluation of the alignment study. An open-ended item asking about recommended changes to improve the workshop or make future workshops run more smoothly was also included at the end of Part 3.

Part 1: Training – 3rd grade. On a scale ranging from 1 - 6, where 1 = Very Unsuccessful and 6 = Very Successful, on average, the teachers rated all components of the training as a 5.0 or higher (Orientation mean = 5.8 (n=5), Overview of Standards mean = 6.0 (n=4), Discussion of the Indicators mean = 6.0 (n=4), Practice with Method mean = 6.0 (n=4), and Overall Training mean = 6.0(n=4)).

When asked to rate the amount of time allocated to training, the average rating was 2.0 (n=5), where a value of 2 was “The right amount of time was allocated to training.” A value of 1 = too little time was allocated to training and 3 = too much time was allocated to training.

Part 1: Training – 11th grade. On a scale ranging from 1 - 6, where 1 = Very Unsuccessful and 6 = Very Successful, on average, the 16 teachers rated all components of the training as a 5.0 or higher (Orientation mean = 5.3, Overview of Standards mean = 5.4, Discussion of the Indicators mean = 5.2, Practice with Method mean = 5.4, and Overall Training mean = 5.4).

When asked to rate the amount of time allocated to training, the average rating was 2.1, where a value of 2 was “The right amount of time was allocated to training.” A value of 1 = too little time was allocated to training and 3 = too much time was allocated to training.

Part 2: Alignment to Content Standards– 3rd grade. The teachers' confidence in their ability to provide their judgments was a mean of 3.8 (n=5) on a four-point scale (1 = Not Confident and 4 = Confident).

The final item in Part 2 asked about the adequacy of time allocated for completing their initial estimates of group performance. On the four-point scale (1 = More time needed and 4 = More than enough time was allotted), the average rating was 3.2 (n=5).

Part 2: Alignment to Content Standards– 11th grade. The teachers' confidence in their ability to provide their judgments was a mean of 3.6 on a four-point scale (1 = Not Confident and 4 = Confident).

The final item in Part 2 asked about the adequacy of time allocated for completing their initial estimates of group performance. On the four-point scale (1 = More time needed and 4 = More than enough time was allotted), the average rating was 3.1.

Part 3: Overall Evaluation of the Alignment Study Workshop– 3rd grade. The first item in Part 3 asked teachers to rate the success of the Alignment Study. The average rate of success was 3.7 (n=5) on a four-point scale (1 = Totally Unsuccessful and 4 = Totally Successful). The final question asked teachers to rate the organization of the workshop (1 = Totally Unsuccessful and 4 = Totally Successful). The average rating for this item was 3.7 (n=5).

Part 3: Overall Evaluation of the Alignment Study Workshop– 11th grade. The first item in Part 3 asked teachers to rate the success of the Alignment Study. The average rate of success was 3.2 on a four-point scale (1 = Totally Unsuccessful and 4 = Totally Successful). The final question asked teachers to rate the organization of the workshop (1 = Totally Unsuccessful and 4 = Totally Successful). The average rating for this item was 3.4. Teachers' comments are included in Appendix E.

Conclusion

The Dakota STEP tests showed a strong relationship to the composite set of South Dakota Core Standards and Indicators for Mathematics. For alignment studies, it is acceptable if the overall agreement level is 75% or higher. Using this criterion, both Mathematics tests core content standards, indicators, and goals matched HEM's intended alignment.

In addition, both grade level tests had 7 or more items align to each goal, but the criterion of at least 7 items per indicator was not met for all indicators in goals. The only

indicators at Grade 3 that did not meet the 7-item criterion were Indicator 1 of Geometry and Indicator 1 of Statistics and Probability. The only indicators in goals that had less than 7-items align in Grade 11 were Indicators 2 and 3 of Algebra, and Indicator 2 of Geometry.

Problems were also identified in the ability of the 11th grade test to accurately and reliably make proficiency level classifications for students. It was frequently the case that there were too few items identified at the Basic level to be able to make confident decisions at the individual student level about students' level of proficiency in mathematics. However, there are a sufficient number of items on the 3rd grade test to accurately and reliably make proficiency level classifications for students.

In general, the alignment of items to the intended HEM alignment was 96% for both grade level tests. In some cases, decisions will need to be made about the development or revisions of test questions in order to provide sufficient coverage at the Indicator level. In addition, in order to make meaningful and trustworthy assignment of students based on their performance on the 11th grade test into Basic, Proficient, and Advanced proficiency levels, work will be needed to identify additional items in order to provide sufficient information to make these classification decisions.

APPENDIX A

Districts from which participating teachers were employed

3rd grade

Rapid City Area Schools—Grandview Elementary

Dakota Valley

Lake Preston

Lennox School

Emery

11th grade

Elk Point

RCAS

Hurley

Lower Brule

Watertown School

Marty Indian

Stanley County High School

Brandon Valley

Wakonda Public Schools

Freeman Public Schools

Montrose

Ogorman

Central

Cheyenne-Eagle Butte

RCAS

Wagner

Appendix B

Sample Rating Form

Content Standards Grade 3	48	50	52	55	63	71	73	74	75	76	77	79	81
X = No match													
Please Indicate:													
B(Basic)**; P**(Proficient)**; A**(Advanced)													
Statistics & Probability													
Stat models to gather, analyze, display data													
to draw conclusions													
1. Ask/Answer questions from data represented													
in bar graphs, pictographs, &tally chart													
2. Gather data & use info to complete a													
scaled and label graph													
Apply concept of prob to pred outcomes/solve prob													
1. Describe events as certain or impossible													

Appendix C

3rd grade items: Original Harcourt designations and results of the alignment studies

		Level	Indicator			Standard		
Item Sequence Number	CID	May-05 or -06	Original designation	May-05	May-06	Original designation	May-05	May-06
1	2104962	A	N1	N1		1	1	
2	2104964	P	N1	N1		1	1	
3	2104965	P	N1	N1		3	3	
5	2104970	P	N1	N1		3	3	
8	2104973	P	N2	N2		1	1	
11	2104976	A	N3	N3		1	1	
12	2104978	P	N2	N2		1	1	
18	2104987	P	A4	A4		1	1	
19	2104989	A	A4	A4		2	2	
20	2104991	P	S1	S1		1	1	
22	2104993	P	S1	S1		1	1	
23	2104995	P	S2	S2		1	1	
29	2105005	P	M1	M1		2	2	
31	2176958	A	N1	N1		3	3	
32	3351237	P	N3	N3		1	1	
33	2176961	A	N2	N2		1	1	
34	3328564	P	N3	N3		1	1	
35	2176969	P	N1	N1		3	3	
36	2176968	P	N1	N1		1	1	
37	3351231	P	N3	N3		1	1	
38	3351232	P	N3	N3		1	1	
39	2176959	P	N2	N2		1	1	
40	2176964	A	N2	N2		1	1	
41	3344693	P	N3	N3		1	1	
42	2104990	P	N2	N2		1	1	
43	2176966	A	N2	N2		1	1	
44	2104968	A	N3	N3		1	1	
45	2104988	P	A3	A3		1	1	

46	2104985	P	A1	A1		1	1	
47	2176919	A	A3	A3		1	1	
48	**3427061**	**A**	**A2**		**A2**	**2**		**2**
49	2176926	A	A3	A3		1	1	
50	**3427063**	**A**	**A2**		**A2**	**2**		**2**
51	2176916	A	A2	A2		1	1	
52	**3427059**	**P**	**A1**		**A1**	**2**		**2**
53	2176982	B	A4	A4		2	2	
54	3328567	P	A1	A1		2	2	
55	**3427062**	**A**	**A2**		**A2**	**2**		**2**
56	2176983	B	A4	A4		1	1	
57	2176903	P	A1	A1		1	1	
58	2176985	P	A4	A4		1	1	
59	2176976	P	A3	A3		1	1	
60	2176973	P	A3	A3		1	1	
61	3344686	P	A2	A2		1	1	
62	2176979	P	A3	A3		1	1	
63	**3426897**	**P**	**A1**		**A1**	**1**		**1**
64	2176917	A	A2	A2		1	1	
65	2176987	A	A4	A4		1	1	
66	2176923	P	A1	A1		2	2	
67	2176918	P	A3	A3		1	1	
68	3344683	P	A2	A2		2	2	
69	2176909	P	A1	A1		1	1	
70	2176977	P	A4	A4		2	2	
71	**3427072**	**P**	**S2**		**S2**	**1**		**1**
72	2176988	A	S1	S1		1	1	
73	**3427070**	**B**	**S2**		**S2**	**1**		**1**
74	**3427067**	**B**	**S1**		**S1**	**1**		**1**
75	**3427071**	**P**	**S2**		**S2**	**1**		**1**
76	**3427068**	**A**	**S1**		**A2**	**1**		**2**
77	**3427074**	**B**	**S2**		**S2**	**1**		**1**
78	2176989	A	S1	S1		1	1	
79	**3427073**	**P**	**S2**		**S2**	**1**		**1**
80	2176992	P	S1	S1		1	1	

81	**3427069**	**B**	**S2**		**S2**	**1**		**1**
82	3328607	A	G1	G1		1	1	
83	3328559	P	G2	G2		1	1	
84	2345753		G1			2		
85	2176942	A	G2	G2		1	1	
86	3328608	P	G1	G1		1	1	
87	2176941	P	G2	G2		1	1	
88	3328617	P	G1	G1		2	2	
89	3328560	P	G2	G2		1	1	
90	2345751		G1			2		
91	3328561	P	G2	G2		1	1	
92	2176930	B	G1	G1		1	1	
93	3351228	A	G2	G2		1	1	
94	2176933	P	G1	G1		1	1	
95	2176940	P	G2	G2		1	1	
96	2176949	P	M1	M1		1	1	
97	2176972	A	M1	M1		2	2	
98	2176950	P	M1	M1		3	3	
99	2176943	A	M1	M1		2	2	
100	2176947	A	M1	M1		2	2	
101	2176946	B	M1	M1		2	2	

Appendix D

11th grade items: Original Harcourt designations and results of the alignment studies

		Level	Indicator			Standard		
Item Sequence Number	**CID**	May-05 or -06	**Original designation**	**May-05**	**May-06**	**Original designation**	**May-05**	**May-06**
2	2108533	P	N1	N1		2	2	
3	2108536	A	N1	N1		1	1	
4	2108537	A	N2	N2		1	1	
10	2108547	P	A4	A4		1	1	
16	2108556	A	S1	S1		1	1	
18	2108558	A	S1	S1		2	2	
22	2108567	P	G1	G1		1	1	
23	2108568	P	G1	G1		1	1	
25	2108572	A	G1	G1		1	1	
31	2108534	P	N1	N1		1	1	
32	3344958	A	N2	N2		1	1	
33	2108152	A	N3	N3		2	2	
34	2108142	P	N1	N1		2	2	
35	3344961	P	N2	N2		1	1	
36	3344964	P	N2	N2		1	1	
37	2108148	A	N3	N3		2	2	
38	2108141	P	N1	N1		2	2	
39	**3430144**	**P**	**N3**		**A2**	**2**		**1**
40	2108149	P	N2	N2		1	1	
41	2177518	P	N1	N1		2	2	
42	**3430146**	**P**	**N3**		**N3**	**2**		**2**
43	3344960	A	N2	N2		1	1	
44	2107755	P	N3	N3		1	1	
45	3344967	P	N1	N1		2	2	
46	2177519	P	N3	N3		1	1	
47	2108147	P	N2	N2		1	1	
48	2108144	P	N3	N3		1	1	
49	2177528	P	A4	A4		1	1	
50	3344974	P	A2	A2		1	1	

51	**3430135**	**P**	**A3**		**A3**	**2**		**2**
52	**3430145**	**P**	**N3**		**N3**	**2**		**2**
53	2177525	A	A4	A4		1	1	
54	2108553	P	A1	A1		1	1	
55	3344977	P	A2	A2		2	2	
56	**3430132**	**P**	**A3**		**A4**	**1**		**1**
57	**3430130**	**P**	**A1**		**A1**	**1**		**1**
58	2108158	P	A3	A3		1	1	
59	2177527	P	A4	A4		1	1	
60	2177516	P	A1	A1		1	1	
61	3344978	A	A2	A2		2	2	
62	**3430131**	**P**	**A1**		**A1**	**1**		**1**
63	2108162	P	A3	A3		1	1	
64	**3430134**	**P**	**A3**		**A3**	**2**		**2**
65	3344970	A	A2	A2		1	1	
66	2108143	P	A2	A2		1	1	
67	2108163	P	A4	A4		1	1	
68	**3430129**	**P**	**A1**		**A1**	**1**		**1**
69	2108157	P	A3	A3		1	1	
70	2177524	P	A4	A4		1	1	
71	2177517	A	A1	A1		1	1	
72	2108154	P	A3	A3		2	2	
73	2108161	A	A2	A2		2	2	
74	2108160	P	A1	A1		1	1	
75	2177529	P	A4	A4		1	1	
76	2108559	B	S1	S1		3	3	
77	**3430158**	**B**	**S2**		**S2**	**2**		**2**
78	2108562	A	S1	S1		1	1	
79	**3430157**	**P**	**S2**		**S2**	**2**		**2**
80	**3430149**	**B**	**S1**		**S1**	**1**		**1**
81	**3430156**	**A**	**S2**		**S2**	**2**		**2**
82	**3430155**	**P**	**S2**		**S2**	**2**		**2**
83	**3430154**	**A**	**S2**		**S2**	**2**		**2**
84	**3430147**	**B**	**S1**		**S1**	**3**		**3**
85	**3430153**	**A**	**S2**		**S2**	**2**		**2**

86	**3430152**	**A**	**S2**		**S2**	**2**		**2**
87	**3430148**	**B**	**S1**		**S1**	**3**		**3**
88	**3430139**	**A**	**G2**		**G2**	**3**		**3**
89	**3430137**	**P**	**G1**		**G1**	**1**		**1**
90	2108188	P	G1	G1		2	2	
91	**3430140**	**A**	**G2**		**N1**	**3**		**2**
92	**3430143**	**P**	**G2**		**G2**	**1**		**1**
93	2108153	P	G2	G2		3	3	
94	2108540	A	G1	G1		1	1	
95	2177507	P	G2	G2		2	2	
96	**3430136**	**P**	**G1**		**G1**	**1**		**1**
97	2108179	A	G2	G2		2	2	
98	2107792	P	G2	G2		2	2	
99	2177509	A	M1	M1		3	3	
100	2177508	P	M1	M1		1	1	
101	2108575	A	M1	M1		3	3	
102	2177514	A	M1	M1		3	3	
103	2177513	A	M1	M1		3	3	
104	2108190	A	M1	M1		3	3	
105	2177510	P	M1	M1		3	3	